REMARKS

Claims 1-4 and 7-9 are all the claims pending in the application. Applicants cancel claims 5 and 6, and add claims 7-9 to further define the invention as discussed in detail below.

The title of the invention is objected to. Applicants amend the title accordingly.

Claims 1-6 are rejected under 35 U.S.C. § 112, second paragraph. Applicants amend the claims to remove any ambiguities.

Claims 1, 3 and 4 are rejected under 35 U.S.C. § 102(e) as being anticipated by Nakajima et al. (5,999,345).

Claims 2, 5 and 6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakajima et al. (5,999,345) in view of Motoi (5,539,719).

Analysis

Claim 1 is rejected as being anticipated by Nakajima. Claim 1 is directed to an optical scanning apparatus which includes two light sources each including light emitting devices arranged in a line at equal intervals, a beam scanner, a beam converging unit, and a controller for always controlling an inclination angle of the light emitting devices with respect to the beam scanning direction of each of the light sources.

The inclination angle of the light emitting devices with respect to the beam scanning direction satisfies the equation: $\sin^{-1}[p/md]$, where, d is the interval between the adjacent semiconductor laser devices, p is the predetermined interval between the adjacent ones of beams on the scanning surface, and m is magnification of the optical system.

Nakajima fails to teach or suggest that the inclination angle satisfies this equation. There is no teaching or suggestion of this feature, and thus, claim 1 is patentable over Nakajima.

Claim 2 should be patentable for at least the same reasons as claim 1, by virtue of its dependency therefrom.

Claim 3 is directed to a controller for always detecting a position in a direction perpendicular to a scanning direction of output beams of each of the light sources even during beam scanning, and for controlling a predetermined pitch interval of scanning lines. As discussed at pages 14-15 of the pending application, the extraction and control of the beam position detecting signal are performed simultaneously with emission of the beams with the use of photodetectors (53, 54, 16).

Although Nakajima discloses a linear sensor 411, this element works completely different from the present invention. The linear sensor 411 is disposed so as to extend toward the sub-scanning direction for determining if the scanning line intervals are changed, for maintaining a constant interval.

In contrast, the photodetectors 53, 54 are irradiated with a part of the optical energy outputted from the light sources 1, 2, as monitoring light (see page 14). Thus these photodetectors monitor the beams at the polarizing prism 3. Thus, these elements are provided in addition to the photodetector 16, which is placed at the scanning lines at the medium.

In view of the foregoing, Applicants amend claim 3 to clarify this feature, and submit that claim 3 is patentable since Nakajima completely fails to teach or suggest this feature.

Claim 4 is also rejected as being anticipated by Nakajima. Applicant amends claim 4 along the lines of claim 1 above. Thus, claim 4 is directed to inclination angles that satisfy the equation $\sin^{-1}[p/md]$, where, d is the interval between the adjacent semiconductor laser devices, p is the predetermined interval between the adjacent ones of beams on the scanning surface, and m

is magnification of the optical system. Thus, claim 4 should be patentable for similar reasons to those discussed above regarding claim 1.

In addition, Applicants add claims 7-9 to further define the invention. Claim 7 is directed ot the a controller for specifying respectively one of the beams from each of the light sources and for keeping an interval, of a predetermined value, between scanning positions in a direction that is perpendicular to the scanning direction. The prior art fails to teach or suggest this feature.

Claim 8 is directed to an optical scanning apparatus which includes a laser light source, a beam scanner, a beam converging unit and a controller. The inclination angle satisfies the equation: $\sin^{-1}[p/md]$. As discussed above with respect to claim 1, the prior art fails to teach or suggest that the inclination angle must satisfy this equation, and thus, claim 8 is patentable.

Finally, claim 9 is directed to an optical scanning apparatus which includes a plurality of light emitting devices at equal intervals, a beam scanner, a beam converging unit between the light source and the beam scanner and a controller. The controller always detects a position in a direction perpendicular to the scanning direction of the output beams even during beam scanning so as to control a predetermined pitch interval of scanning lines. The controller detects the positions with photodetectors that are irradiated by light from a polarizing prism which his disposed between the laser light source and the beam scanner. Claim 9 is patentable for similar reasons to claim 3, because the prior art fails to disclose photodetectors are irradiated with a part of the optical energy outputted from the light sources as monitoring light and that these photodetectors monitor the beams at the polarizing prism. Thus, claim 9 is patentable.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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Date: October 3, 2002

Attorney Docket No.: Q63511

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

The title is changed as follows:

OPTICAL SCANNING APPARATUS USING A PLURALITY OF LASER BEAMS

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) An optical scanning apparatus adapted to perform parallel scanning with a plurality of beams on an image recording medium at predetermined pitches, said apparatus comprising:

two semiconductor laser light sources each including a plurality of light emitting devices arranged in a line at equal intervals;

a beam scanner;

a beam converging unit disposed between the laser light sources and the beam scanner for converging the light beams onto the surface of the beam scanner; and

a controller for always controlling an inclination angle of said plurality of light emitting devices with respect to a beam scanning direction of each of said semiconductor laser light sources,

wherein said inclination angle satisfies the equation: sin-1[p/md], wherein, d is an interval between adjacent ones of said light emitting devices, p is a predetermined interval between adjacent ones of said light beams on a scanning surface, and m is magnification of the optical scanning apparatus.

3. (Amended) An optical scanning apparatus adapted to perform parallel scanning with a plurality of beams on an image recording medium at predetermined pitches, said apparatus comprising:

two semiconductor laser light sources each including a plurality of light emitting devices arranged in a line at equal intervals;

a beam scanner;

a beam converging unit disposed between the laser light sources and the beam scanner for converging the light beams onto the surface of the beam scanner; and

a controller for always detecting a position in a direction perpendicular to a scanning direction of output beams of each of said light sources even during beam scanning and for controlling a predetermined pitch interval of scanning lines owing to variation in relative position of each of said light sources,

wherein said controller detects the positions of the output beams with photodetectors that are irradiated by light from a polarizing prism which is disposed between said laser light sources and said beam scanner.

4. (Amended) An optical scanning apparatus adapted to perform parallel scanning with a plurality of beams on an image recording medium at predetermined pitches, said apparatus comprising:

two semiconductor laser light sources each including a plurality of light emitting devices arranged in a line at equal intervals;

a beam scanner;

a beam converging unit disposed between the laser light sources and the beam scanner for converging the light beams onto the surface of the beam scanner; and

a controller for always controlling a position in a direction perpendicular to a beam scanning direction of output beams of each of said light sources and controlling an inclination angle of arrangement of said plurality of light emitting devices with respect to [a] the beam scanning direction of each of said semiconductor laser light sources,

wherein said inclination angle satisfies the equation: sin-1[p/md], wherein, d is an interval between adjacent ones of said light emitting devices, p is a predetermined interval between adjacent ones of said light beams on a scanning surface, and m is magnification of the optical scanning apparatus.

Claims 7-9 are added as new claims.

IN THE ABSTRACT OF THE DISCLOSURE:

The abstract is changed as follows:

In [A] a simultaneous multibeam scanning system, composite beams are formed by using two semiconductor laser arrays each of which can singly output a plurality of beams. An optical system is enabled to scan beams of the number, which corresponds to the sum total of output beams of each of laser light sources, in a scanning plane. A stabilization control means for maintaining the interval between adjacent scanning beams at a uniform value is introduced into this optical system.